

Your Green Conscience¹ and Consumer Products

Course code and course title	SCH3U Chemistry, Grade 11, University Preparation or SCH4C Chemistry, Grade 12, College Preparation
Name of learning activity/activities	Your Green Conscience¹ and Consumer Products – using STSE’s to engage students, develop scientific investigation skills, and build an understanding of basic concepts in chemistry
Brief description of learning activity/activities	In this activity, students are introduced to the “Green Conscience” and the big idea that studying chemistry is important to use chemicals properly to minimize the risks to human health and the environment. In cooperative learning groups, students research and investigate the chemical composition of a consumer product, the properties of the chemicals, and their impact on human health and the environment. Their research is used to create an action plan to reduce the impact of the product or suggest safe alternatives. Components of this activity can be used to introduce and explore some basic concepts of chemistry (e.g. properties, bonding) and it can also be used as a link to all strands in the course.
Duration	Approximately 4 to 6 hours (but this will vary according to teacher’s decision to follow all or some of the steps listed).
Overall expectations	<p><i>Strand A: Scientific Investigation Skills and Career Exploration</i> A1. demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analyzing and interpreting, and communicating)</p> <p>SCH3U <i>Strand B: Matter, Chemical Trends, and Chemical Bonding</i> B1. analyse the properties of commonly used chemical substances and their effects on human health and the environment, and propose ways to lessen their impact</p> <p>SCH4C <i>Strand B: Matter and Qualitative Analysis</i> B1. evaluate the effects of chemical substances on the environment, and analyse practical applications of qualitative analysis of matter</p>
Specific expectations	<p><i>Strand A: Scientific Investigation Skills and Career Exploration</i></p> <ul style="list-style-type: none"> • formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research • identify and locate a variety of print and electronic sources that enable them to address research topics fully and appropriately • select, organize, and record relevant information on research topics from a variety of appropriate sources, including electronic, print, and/or human sources, using suitable formats and an accepted form of academic documentation • communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats (e.g., data tables, laboratory reports, presentations, debates, simulations, models)

¹The “Green Conscience” was presented at a Camp OTF workshop in July 2009 by Franke James as an outgrowth of her book *Bothered By My Green Conscience* © copyright 2009. It is a copyrighted presentation and exercise and is used with permission in this activity.

	<p>SCH3U <i>Strand B: Matter, Chemical Trends, and Chemical Bonding</i></p> <ul style="list-style-type: none"> • evaluate the risks and benefits to human health of some commonly used chemical substances • analyse, on the basis of research, the properties of a commonly used but potentially harmful chemical substance and how that substance affects the environment, and propose ways to lessen the harmfulness of the substance or identify alternative substances that could be used for the same purpose <p>SCH4C <i>Strand B: Matter and Qualitative Analysis</i></p> <ul style="list-style-type: none"> • evaluate the risks and benefits to the environment of some commonly used chemical substances 	
Catholic graduate expectations (if applicable)	<p>CGE2b -reads, understands and uses written materials effectively; CGE2c -presents information and ideas clearly and honestly and with sensitivity to others; CGE3b -creates, adapts, evaluates new ideas in light of the common good; CGE3c -thinks reflectively and creatively to evaluate situations and solve problems; CGE4f -applies effective communication, decision-making, problem-solving, time and resource management skills; CGE5a -works effectively as an interdependent team member; CGE5e -respects the rights, responsibilities and contributions of self and others; CGE5g -achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others; CGE7i -respects the environment and uses resources wisely;</p>	
Essential Skills and work habits	<ul style="list-style-type: none"> • Reading Text • Writing • Document Use • Computer Use • Oral Communication • Thinking Skills <ul style="list-style-type: none"> ○ Decision Making ○ Problem Solving ○ Finding Information 	<ul style="list-style-type: none"> • Teamwork • Reliability • Working Independently • Initiative • Self-advocacy

Instructional/Assessment Strategies

Teacher's notes

- Access Franke James' website (www.frankejames.com) and familiarize yourself with
 - (i) the introduction for "Sparking Your Green Conscience" (<http://www.frankejames.com/debate/?p=940>)
 - (ii) the visual essay "No One Will Know, Except You" (click on the hyperlink or visit <http://www.frankejames.com/debate/?p=122>)

Note: If a hyperlink does not work, copy and paste web addresses into your internet browser.

- Five questions are presented in the "Take this little test to find out" section of the "Sparking Your Green Conscience" introduction to get students thinking about a *green conscience*. If necessary, adapt the list of questions to make it more relevant to the chemistry curriculum (see Appendix A for suggestions).
- Consider presenting the website on a projector so that you can read the introduction and visual essay together as a class or print a copy and read it as a story to the class.
- Photocopy the required number of worksheets, checklists, and rubrics, if applicable (see Appendices).
- Students will require computer access to complete the research component.
- Prepare a list of websites that may be useful for students to start their research.
- When setting up groups, consider grouping students with varying learning strengths (e.g. high and low students, visual and kinesthetic learners, etc.) This would require prior assessment.
- Consider assigning roles to students (e.g. team leader, lead researcher, artistic director, communications consultant).
- In step 8 of the strategies, consider reviewing Franke James' website to show her action plan for hair dyes as an example (<http://www.frankejames.com/debate/?p=941>).
- Consider guiding students to write a question that they propose to answer through their action plan. For example, after researching the chemicals that make up lipstick, students may focus on a paraben and decide "What makes a paraben toxic to humans and other living things, and are consumers aware of safer alternatives?"
- Consider using a science journal or science lab notebook as a scrapbook for students to record ideas and research data.
- After reading through the strategies, you may decide to complete the entire activity and evaluate the final product or use some components of the activity to engage students to start thinking critically about common chemicals. Students can revisit the activity to make connections to STSE's in other strands and/or as a culminating performance task for the course.

Context

Strand B introduces important basic concepts that students will use throughout the course. This activity uses the "green conscience" concept to engage students by making it relevant through the STSE overall expectation. Although the activity presents the "green conscience" through storytelling (i.e. reading the online visual essay to the class) and questioning to stimulate inquiry, the teacher can choose alternative methods to present it.

It is an activity that can be used at the start of the course to help assess student readiness in skills related to thinking and investigation, communication, application, team work, work habits, and initiative (see Appendix F and Appendix G for examples of a checklist and rubric to help with assessment). It is also an activity that lends to differentiated instruction and can be revisited throughout the course to continually keep students engaged in chemistry.

The teacher can use the "green conscience" to link all of the STSE expectations in this course and as part of the course's culminating performance task. Furthermore, the "green conscience" idea can be integrated into other courses. It is a tool that will help support environmental stewardship and lifelong learning by allowing students to be proactive thinkers about everything they use and how it has an impact on humans and the environment.

Strategies

1. Give students access to the website: <http://www.frankejames.com/debate/?p=940> and give them time to read
 - (i) the introduction for “Sparkling Your Green Conscience”
 - (ii) the visual essay “No One Will Know, Except You”or
 - (i) use/adapt the list of questions to get students thinking about a *green conscience* (see Appendix A for suggestions).
 - (ii) read the “No One Will Know, Except You” to the class
2. Using a Think-Pair-Share strategy, students think about and share ideas with an elbow partner for the following questions (see Appendix B for student worksheet):
 - “What do you think is a green conscience?”*
 - “Is there something we can do to help our green conscience?”*
 - “Can the study of chemistry help our green conscience?”*
 - “What can you do to help your green conscience?”*
3. As a class, discuss the answers to these questions. Record answers on the board and guide the class into a discussion of chemicals in the news. For example, plastics containing bisphenyl A, cosmetics containing parabens, triclosan in hand sanitizers, etc. You may consider supplying a list of some chemicals to facilitate the discussion. See Appendix C for a sample series of questions you can use to guide the discussion.
4. Share the learning goals with the class:
 - Analyze the effects of consumer products on humans and the environment.
 - Propose a way to reduce the impact of consumer products.
5. Discuss Part 1 of the activity with the class (see Appendix D).
6. In small groups, students choose a consumer product using a choice board (see Appendix E). Students may need to find the product at home and bring it into class the following day.
7. In the same small groups, students complete Part 1 of the activity.
8. As a group, students analyze their research and brainstorm an action plan to complete Part 2 of the activity.
9. Discuss the success criteria for Part 2 with each group or as a class. Consider co-constructing the criteria.
10. As a class, present the action plans and then discuss the importance of understanding physical and chemical properties of elements and compounds in order to use them properly. Use this discussion as a lead into other learning goals for the unit that focus on overall expectations B2 and B3.

Assessment and Evaluation of Student Achievement

Strategies/Tasks	Purpose
1. exit card or journal writing	Assessment for learning – use as a checkpoint
2. self-assessment checklist	Assessment as Learning – self-monitoring of learning goals and skills
3. rubric	Assessment for Learning – for use as an introductory activity Assessment of Learning – for use as a summative performance task
Assessment tools Appendix F – sample checklist Appendix G – sample rubric *adapt the checklist and rubric to meet success criteria from Step 9 of strategies	

Additional Notes/Comments/Explanations

Use the resource list below for background information on

- current issues of toxic chemicals in the news
- classroom strategies for inquiry-based learning and differentiated instruction

The resource list can also be used to introduce the activity with an alternative to the green conscience concept. For example, the Toxic Nation website has the article “School Supplies Pose Toxic Threat to Children’s Health”; it can be used as a relevant issue to engage students and stimulate discussion and inquiry.

Consider administering student inventories to help assess learning preferences and interests. Use the inventories to guide you in setting up the activity and the cooperative learning groups.

Resources

Print

Hume, Karen (2008). *Start Where They Are*. Toronto, ON: Pearson Professional Learning.

James, Franke (2009). *Bothered By My Green Conscience* © copyright 2009. Gabriola Island, BC: New Society Publishers.

Llewellyn, Douglas (2005). *Teaching High School Science Through Inquiry*. Thousand Oaks, CA: Corwin Press.

Marzano, Robert J., Pickering, Debra J., Pollock, Jane E. (2001). *Classroom Instruction that Works: Research-Based Strategies for Increasing Student Achievement*. Alexandria, VA: ASCD.

Ministry of Education (2009). *Acting Today, Shaping Tomorrow: A policy framework for environmental education in Ontario schools*.

Ministry of Education (2009). *Differentiated Instruction Teaching/Learning Examples*.

Ministry of Education (2008). *The Ontario Curriculum, Grades 11 and 12, Science, Revised*.

Smith, Rick, Lourie, Bruce. (2009). *Slow Death by Rubber Duck: How the Toxic Chemistry of Everyday Life Affects our Health*. Toronto, ON: Knopf Canada

Software

- Internet browser
- Word processing software, if applicable

Websites

Environmental Working Group. Web. August 25, 2009. <<http://www.ewg.org/>>

James, Franke. *Sparking Your Green Conscience* © copyright 2009. The James Gang, 2009. Web. August 7, 2009. <<http://www.frankejames.com/debate/?p=940>>

James, Franke. *No one will know, except you* © copyright 2009. The James Gang, 2009. Web. April 20, 2009. <<http://www.frankejames.com/debate/?p=122>>

James, Franke. *The Beehive and the Hairball* © copyright 2009. The James Gang, 2009. Web. August 21, 2009. <<http://www.frankejames.com/debate/?p=941>>

Consumer Product Safety. Health Canada. Web. August 25, 2009. <<http://www.hc-sc.gc.ca/cps-spc/index-eng.php>>

Guide to Less Toxic Products. Environmental Health Association of Nova Scotia. Web. August 25, 2009. <<http://lesstoxicguide.ca/>>

Skin Deep: Cosmetic Data Base. Environmental Working Group. Web. August 25, 2009. <<http://www.cosmeticsdatabase.com/>>

Toxic Nation. Environmental Defence. Web. August 25, 2009. <<http://www.toxicnation.ca/>>

Accommodations

- If a student has an IEP, consideration needs to be given to the accommodations in the IEP.
- Consider setting up cues for higher order thinking skills. For example, when students are required to come up with a testable/researchable question, provide a generic question with blanks to be filled in. A suggested generic question may include: "What makes _____ toxic to humans and other living things, and are consumers aware of _____?"
- Provide samples of consumer products to groups of students who require the product's physical presence.
- Provide students extra time if necessary.
- Provide opportunities for students to work independently on some aspects of the activity.

List of Attachments

Appendix A – **Sparking Your Green Conscience on Consumer Products**

Appendix B – **Green Conscience Think-Pair-Share Worksheet**

Appendix C – **Sample Dialogue using Questions for Inquiry**

Appendix D – **Your Green Conscience & Consumer Products**

Appendix E – **Consumer Products Choice Board**

Appendix F – **Sample Checklist for Self-Assessment**

Appendix G – **Sample Rubric**

Appendix A: Sparking Your Green Conscience on Consumer Products

This is a series of alternate questions for the “Take this little test to find out” section of the “Sparking Your Green Conscience” website.

1. Do you wonder about the toxic chemicals that are produced everyday to make the stuff you use?
2. Do you worry about toxic chemicals in our drinking water?
3. Do you try to avoid using plastic containers because they can leach toxic chemicals into your food?
4. Do you wonder about the safety of the chemicals found in soaps, shampoos, deodorants, and other toiletries?
5. Do you worry about the amount of toxic waste being released into the environment because of consumerism?

If you answered yes to any of these questions, then according to Franke James (www.frankejames.com/debate/?p=940), you may be developing a green conscience.

Appendix B: Green Conscience Think-Pair-Share Worksheet

Brainstorm answers to each question and then share your ideas with an elbow partner. Add extra ideas to your list while sharing ideas.

<p>What do you think is a green conscience?</p>	<p>Is there something we can do to help our green conscience?</p>
<p>Can the study of chemistry help our green conscience?</p>	<p>What can you do to help your green conscience?</p>

Appendix C: Sample Dialogue using Questions for Inquiry

Teacher: How can we define a green conscience? [3 second pause] Student 1?

Student 1: Green is a colour but it also refers to the environment. Our conscience helps us to decide on right or wrong. So, I think a green conscience refers to making the right environmental decision.

Teacher: Great answer! Does anyone agree or disagree? Or perhaps, does anyone want to add to that definition? [3 second pause] Student 2?

Student 2: I think that we can word it so that we're thinking about our daily actions, its impact on the environment, and deciding whether it is good or bad.

(Continue the discussion until the class is satisfied with a definition and the four questions of the think-pair-share are discussed. During the discussion, a student may bring up chemicals in the news. If not, begin to guide the conversation in that direction.)

Student 3: Since chemistry is the study of matter, the stuff that we use everyday, then we can learn about the interaction of this stuff with the environment.

Teacher: Great answer! Now, does anyone know if there is any work being done to analyze the interactions of chemicals in the environment? [3 second pause] Student 4?

Student 4: I think the government sets up regulations. But some environmentalists complain that the regulations aren't always good.

Teacher: [3 second pause] Student 5, do you have a question?

Student 5: Why would the government set up bad regulations on chemicals?

Teacher: Great question! What do you think?

Student 5: I think regulations help us. We know how much of a chemical is good for us and when too much can be bad.

Teacher: Yes, I agree with you. Student 6, would you like to add to that answer?

Student 6: I think the chemical industry plays a big role too. Plastic baby bottles were in the news last year because of a chemical that could be harmful to babies.

Teacher: [3 second pause] Student 7, would you like to add to that comment?

Student 7: I think it was something called BPA.

Teacher: That sounds familiar to me. Student 8, could you share something about BPA in the news?

Student 8: I read somewhere that BPA is an acronym for bisphenyl A. It behaves like a hormone and it can disrupt regular hormone activity.

Teacher: Great answer! How can this be harmful? [3 second pause] Student 9?

Student 9: A disruption of the chemicals in our body can change how things work. It's like when cells don't divide properly. It can lead to cancer.

Teacher: Yes, great answer! Now, is it only harmful to humans? [3 second pause] Student 10?

Student 10: No. All living things can be harmed by the same bad chemicals.

Teacher: [3 second pause] Student 11, do you have a question?

Student 11: How would other living things, like a bird, get toxic chemicals from a baby bottle?

Teacher: [3 second pause] Student 12, did you hear the question?

Student 12: Yes, but I'm not sure how.

Teacher: [3 second pause] That's a fair answer. Can someone suggest a possibility for Student 11? [3 second pause] Student 13?

Student 13: In grade 10, we learned that everything we use eventually goes back into the environment. So, if a plastic bottle has BPA and we pour stuff down the sink from that bottle, then eventually it will get into our water system. Once it's in our water system, it can get anywhere in the environment.

Teacher: Great connection! Does this bother your green conscience class? If so, what can we do about it?

(Continue the discussion, introduce the activity and get students thinking of alternatives and action plans.)

Appendix D: Your Green Conscience & Consumer Products


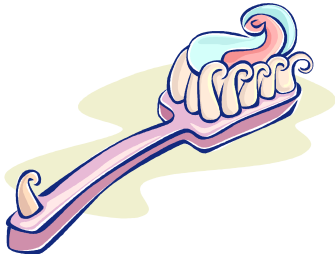






Part 1:

- Using a choice board, choose a consumer product.
- Analyze the list of chemicals that make up the product. This may be included on your product (e.g. ingredient list on shampoo bottle) or you may need to research online. Some questions to think about (but not limited to) include: Do any of the chemicals sound familiar? Do you know if some are toxic? Will you complete an online search of chemical names and learn about their properties? Should you make a list of any chemicals you think that may pose a health or environmental problem? Is there something else you would like to research about the product?
- Research the properties of the chemicals in your list and evaluate any risks or benefits of these chemicals on humans and the environment.

Part 2:

- Based on your research, decide on something to further explore. For example:
 - ✓ Is there a chemical that concerns you?
 - ✓ What makes the chemical harmful?
 - ✓ How does the chemical interact in humans and the environment?
- Write a testable/researchable question for your proposal in the above step. Include an action plan to help reduce the use of the chemical or to research safer alternatives. For example, "What makes a paraben toxic to humans and other living things, and are consumers aware of safer alternatives?"
- Brainstorm ideas to help answer your question.
- Document and communicate your findings (e.g. visual essay)

Appendix E: Consumer Products Choice Board

<p>Electronic Devices e.g. computer, digital camera</p> 	<p>Personal Care Products e.g. cosmetics, shampoos, toothpaste</p> 
<p>Clothing e.g. polyester, Gore-Tex</p> 	<p>Kitchen Products e.g. non-stick frying pans</p> 
<p>Pharmaceuticals e.g. cough syrup, sinus medication</p> 	<p>Food Products e.g. diet cola, trans-fats</p> 
<p>Cleaning Products e.g. bleach, "green" cleaners</p> 	<p>Any other product of your choice (with teacher approval)</p> 

(source of images: Microsoft Word ClipArt)

Appendix F: Sample Checklist for Self-Assessment

Name:

Category/Criteria	<input checked="" type="checkbox"/>
<i>Thinking and Investigation</i> I am able to:	
• research the chemical composition of my everyday product	
• analyze the information I researched to make sure it is logical, accurate, reliable, adequate, and unbiased	
• write a “testable/researchable” question based on my research	
• develop an action plan	
<i>Communication</i> I am able to document my research and action plan:	
• clearly and accurately	
• using appropriate language	
• logically	
• in the correct format of my choice (e.g. visual essay)	
I am able to share my understanding through discussion	
<i>Application</i> I am able to:	
• assess the impact of my chosen chemical(s) to humans and the environment	
• propose a practical action plan to reduce the impact of the chosen chemical(s)	
• propose practical and safe alternatives to the chosen chemical(s)	
<i>Learning Skills</i> I am able to:	
• approach the task with confidence, a positive attitude, and self-motivation	
• work cooperatively in my group	
• take responsibility of my own share of the work to be done	
• contribute original ideas to help make decisions and reach agreements	
• show respect to the ideas and opinions of others in the group	
• recognize the contribution of other group members	
• manage and organize information that I researched	
• seek assistance when necessary	

Appendix G: Sample Rubric

Categories/Criteria	Level 1	Level 2	Level 3	Level 4
<i>Thinking and Investigation</i>	The student:			
Gathers relevant evidence and data from a variety of sources.	Gathers evidence and data with limited relevance from a variety of sources	Gathers evidence and data with some relevance from a variety of sources	Gathers evidence and data with considerable relevance from a variety of sources	Gathers evidence and data with a high degree of relevance from a variety of sources
Analyzes evidence and data to effectively write a testable or researchable question	Analyzes evidence and data to write the question with limited effectiveness	Analyzes evidence and data to write the question with some effectiveness	Analyzes evidence and data to write the question with considerable effectiveness	Analyzes evidence and data to write the question with a high degree of effectiveness
Selects appropriate strategies to develop a relevant action plan	A relevant action plan is developed using strategies with limited effectiveness	A relevant action plan is developed using strategies with some effectiveness	A relevant action plan is developed using strategies with considerable effectiveness	A relevant action plan is developed using strategies with a high degree of effectiveness
<i>Communication</i>	The student:			
Expresses and organizes research, ideas and action plan using proper format of choice	Expresses and organizes research, ideas and action plan with limited effectiveness of format chosen	Expresses and organizes research, ideas and action plan with some effectiveness of format chosen	Expresses and organizes research, ideas and action plan with considerable effectiveness of format chosen	Expresses and organizes research, ideas and action plan with a high degree of effectiveness of format chosen
Orally communicates understanding of research and action plan	Orally communicates understanding of research and action plan with limited effectiveness	Orally communicates understanding of research and action plan with some effectiveness	Orally communicates understanding of research and action plan with considerable effectiveness	Orally communicates understanding of research and action plan with a high degree of effectiveness
<i>Application</i>	The student:			
Assesses impact of chosen chemical(s) to humans and the environment and proposes a practical action plan or safe alternative	Assesses impact and proposes a practical action plan or safe alternative with limited effectiveness	Assesses impact and proposes a practical action plan or safe alternative with some effectiveness	Assesses impact and proposes a practical action plan or safe alternative with considerable effectiveness	Assesses impact and proposes a practical action plan or safe alternative with a high degree of effectiveness